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14. ABSTRACT

A spectral representation formalism was developed to determine the effects of the different parameters, shape, size, geometrical and material composition of the system, to clearly understand the properties of surface plasmons. With this knowledge it was possible determine how to modify the frequency, intensity, spatial localization and other characteristic ingredients of the surface plasmons in noble metal nanoparticles. The spectral representation formalism can be applied to understand the interaction among nanoparticles, and thus it can be applied to study surface plasmon resonances on 1D and 2D arrays for the control of enhanced spectroscopies. This work was published in the Journal of Chemical Physics (2011). We also developed analytical expressions to study metallic wedges and their role to maximize the electromagnetic field enhancements, which could be useful to analyze certain molecules using Surface Enhanced Raman Spectroscopy (SERS) and Plasmon-controlled or Metal Enhanced Fluorescence Spectroscopy (MEFS). This work will be submitted soon.

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Surface plasmon resonances, noble metal nanoparticles, spectral representation, nanoshells, nanospheres

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Annual accomplishments (200 words max): A spectral representation formalism was developed to determine the effects of the different parameters, shape, size, geometrical and material composition of the system, to clearly understand the properties of surface plasmons. With this knowledge it was possible determine how to modify the frequency, intensity, spatial localization and other characteristic ingredients of the surface plasmons in noble metal nanoparticles. The spectral representation formalism can be applied to understand the interaction among nanoparticles, and thus it can be applied to study surface plasmon resonances on 1D and 2D arrays for the control of enhanced spectroscopies. This work was published in the Journal of Chemical Physics (2011). We also developed analytical expressions to study metallic wedges and their role to maximize the electromagnetic field enhancements, which could be useful to analyze certain molecules using Surface Enhanced Raman Spectroscopy (SERS) and Plasmon-controlled or Metal Enhanced Fluorescence Spectroscopy (MEFS). This work will be submitted soon.

Archival publications (published) during reporting period:

1. C. E. Román-Velázquez, Cecilia Noguez, *"Designing the plasmonic response of shell nanoparticles: Spectral representation"* The Journal of Chemical Physics **134**, 044116 (2011).

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